From: SEEDS Joshua
To: Leinenbach, Peter; Kubo, Teresa; Henning, Alan; Powers, David
Subject: RE: Forestry effects at the WRC paired watershed studies
Date: Tuesday, January 07, 2014 2:16:57 PM
Attachments: Forest Roads Management Approach_draft_02-05-2013.docx
Integrated Road Management Outline_draft_01-17-2013.docx

Forest Roads document from MidCoast TMDL efforts attached. As I mentioned, this is halfway through a major re-organization/revision, but I think the pieces are all there. The first 11 pages are best organized include the road metrics I mentioned. Also attached in the Integration Document that describes the overall road approach across land uses (forestry roads, ag roads, public roads). We were using this as part of an approach going beyond forest roads to include impacts of ag roads and public roads.

Thanks,

Josh

From: Leinenbach, Peter [mailto:Leinenbach.Peter@epa.gov]
Sent: Tuesday, January 07, 2014 12:59 PM
To: SEEDS Joshua; Kubo, Teresa; Henning, Alan; Powers, David
Subject: RE: Forestry effects at the WRC paired watershed studies

Thanks Josh

From: SEEDS Joshua [mailto:SEEDS.Joshua@deq.state.or.us]
Sent: Tuesday, January 07, 2014 12:53 PM
To: Leinenbach, Peter; Kubo, Teresa; Henning, Alan; Powers, David
Cc: SEEDS Joshua
Subject: Forestry effects at the WRC paired watershed studies

Pete et al,

Attached is the email I sent to DEQ staff and managers after last April's Paired Watershed Study Symposium, describing claims I heard by some presenters that do not seem to be scientifically grounded. Also attached are my meeting notes for November's "Policy Workshop". The basic line of argument is that the fish seem to be fine in the very short-term, so there are no problems. Within my meeting notes are a mix of my recollections of the presentations themselves along with notations and issues that I noticed. I have tried to mark my notes using brackets and other sorts of labels. Both of these events deal with the three ongoing paired watershed studies in Oregon (Hinkle Creek, Alsea Revisited, Trask River).

This information is FYI only for you all. I don't want this widely spread at this point, as the means and timing of publically disagreeing with the opinion of some of the assertions being made is very important. There will be a more detailed assessment of DEQ's take on the science from these paired watershed studies forthcoming; that will be something which is more widely distributed. Any help that you are able to give in assembling the evidence (published studies or new analysis) that shines light on unfounded claims being made would be most appreciated.

Let me know if you have any questions or comments.

Thanks,

Josh

Joshua Seeds
Nonpoint Source Pollution Analyst
Drinking Water Protection Program
Oregon Department of Environmental Quality

811 SW 6th Ave.
Portland, OR 97204
Phone: 503-229-5081 Fax: 503-229-6037
Email: seeds.joshua@deq.state.or.us

DRAFT Forest Road Management Approach

Mid Coast Implementation-Ready Total Maximum Daily Load:

Forest Roads Desired Outcomes, Reporting & Planning Metrics, and Management Measures

This document describes the goals and requirements for reducing sediment pollution from forest roads in the Mid-Coast basin under the Oregon Department of Environmental Quality's (DEQ's) Implementation-Ready Total Maximum Daily Load (IR-TMDL) for the basin. This document was crafted in consultation with the Oregon Department of Forestry (ODF), the U.S. Environmental Protection Agency (EPA), and stakeholders.

The Oregon Forest Practices Act (ORS Chapter 527) was created in 1971. Related Oregon Administrative Rules (OAR Chapter 629) have been revised over time to reflect increasing scientific knowledge and social expectations. Revisions to the Road Construction and Maintenance administrative rules over time have reduced negative impacts to water quality. Forest roads built consistent with the current OAR Chapter 629, Division 623, "Forest Roads-Road Construction and Maintenance Rules" are likely protective of water quality.

Concern exists about roads built prior to current standards (so-called "legacy" roads). The actual state of the forest road network on forestlands is not known to EPA and DEQ, so determining the full impact of forest roads, legacy and otherwise, is not possible. Forest roads as a source of fine sediment and as a contributor to changes in hydrology, geomorphology, and fish passage are well documented. Sediment production can be affected by road location, construction, and use patterns. Sedimentation from roads can be chronic (due to hydrologic connection during common rain events) or episodic (such as failures of crossing structures and/or the road prism or diversion of the stream down the roadway). Improperly constructed road crossings can block fish passage and close off habitat to anadromous and resident fish. Roads networks alter hydrology by intercepting groundwater, changing the flow paths of rainwater, and channeling the resulting runoff. Roads built in riparian areas can directly interfere with stream morphology, and changes to hydrology and sediment regime due to roads can also affect fluvial geomorphology. Improved construction, maintenance, and stormwater management practices are now available and in use over many portions of the forest roads network such as more robust crossing designs that resist erosion and failure and allow fish passage. Water quality improvements related to changes in road management practices have been documented in several cases (Reiter *et al* 2009 and CMER). (e.g. Reid & Dunne 1984, Jones *et al* 2000, Reiter *et al* 2009)

Commented [jds1]: Add citations.

Roads constructed using Forest Practices Act (FPA) rules and guidance in place since 1984 use improved siting, design, and construction practices and have acceptable levels of risk for crossing structure and road prism failures that impact water quality. Fish passage and high flow design improvements were added to rules in 1994; drainage- and wet weather hauling-related changes to FPA rules in 2003 further improve road performance. As a result, roads built to current specifications are likely hydrologically disconnected to the greatest degree possible and adequately protective of water quality when those rules are properly implemented. While all roads require ongoing inspections and maintenance, roads built under current FPA standards and guidelines represent substantially lower risk to water quality than older roads. Road age, however, does not directly result in poor water quality, nor is the age, reconstruction, or maintenance history of a given road likely to be readily available. The intent of the IR-TMDL management measures is to reduce the risk levels from roads that were constructed using

methods or in locations that may be problematic for water quality and to minimize, to the maximum extent practicable, introduction of sediment pollution from all forest roads to waters of the state.

The Forest Roads Management Approach is part of the MidCoast IR-TMDL, and, in concert with the Public Roads and Agricultural Roads Management Approaches, details an overall road management approach to minimize the effect to the transportation network on water quality and sediment regimes. The Forest Roads Management Approach is designed to address any existing backlogs in maintenance, reconstruction or vacation of high-risk road segments and crossings, and other existing problems, building on substantial voluntary efforts already completed by landowners under the Oregon Plan for Salmon and Watersheds (Oregon Plan). This document does not address road maintenance required by the FPA. If landowners and other parties responsible for roads are not complying with the road maintenance rules, then ODF's current compliance and enforcement authorities should address that problem. This approach describes measures to identify road segments and locations that are considered at risk of delivering sediment or turbidity to waters of the state, bring the road network to a level of performance that is consistent with current construction and maintenance practices, and reduce and prevent water quality impacts. This creates the additional benefit of a more resilient road network that will be less expensive for landowners to maintain and repair and less likely to be severely damaged by large storms.

It is the intent of DEQ that previous efforts to improve road performance, stability, and hydrologic disconnection will be accounted for and that landowners will be given credit for past, present, and future voluntary actions under the Oregon Plan, third-party forest certification systems, planning programs such as the Stewardship Plan program, or Stewardship Agreements with ODF, or other documented landowner efforts. For example, road inventories done for the Oregon Plan can be used as the baseline for road condition, and subsequent improvements done since then can be applied towards meeting milestones in the timeline for implementation of this Approach (see Table 1 below). Likewise, United States Forest Service and the Bureau of Land Management have road evaluation and management protocols in place that could be submitted as alternate plans (see Planning Section). A primary purpose of adding this Approach to existing efforts is to fill information gaps and to identify situations (if any) where current required and voluntary efforts are not sufficient.

TMDL Goals & Objectives

Water Quality Goals

- An efficient and beneficial forest road network that is located, designed, constructed, maintained or vacated in a manner that provides the maximum practical protection to maintain water quality.
- No more than 10% increase in turbidity due to forest roads at relevant compliance point, e.g. downstream of crossing structures or due to road-related landslides (Turbidity Standard: OAR 340-041-0036).
- No impairment of aquatic life and drinking water use due to anthropogenic sedimentation (Biocriteria, Potability of Drinking Water, and Sediment narrative standards: OARs 340-041-0011, 340-041-0007(11), and 340-041-0007 (12), respectively).

Forest Roads Goals

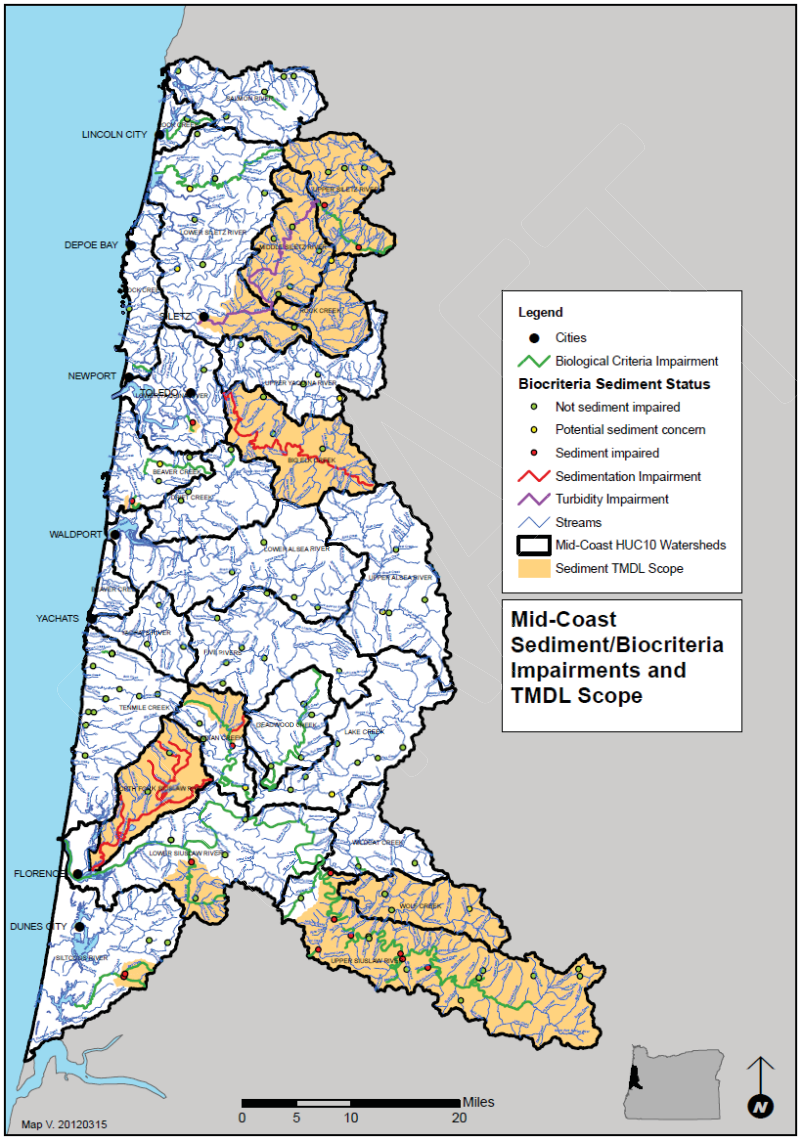
- No exceedance of water quality standards due to forest roads or forestry operations on public roads.
- Hydrologically disconnected road network (to the maximum extent possible) using available BMPs and good design principles.

Forest Road Objective(s)

- Entire road network should meet current Forest Practices Act requirements and guidelines as the means of achieving water quality goals for sediment.
- Road maintenance operations are performed as needed including regular inspections and storm patrols, thereby meeting FPA requirements.
- Any pre-FPA roads and problem road segments are known by landowner with potential problems identified.
- Owner/operator has a road management plan, including the information and assessment metrics below.

Geographical Scope of IR-TMDL

The sediment portion of the Implementation-Ready Total Maximum Daily Load (IR-TMDL) load allocations and management measures apply to the areas identified on the 2010 303(d) list. These areas are shown on the attached map. The requirements of the IR-TMDL for sediment do not apply to the remainder of the Mid-Coast basin, but DEQ encourages implementation basin-wide.



Components:

1. **Working definition of which roads are covered by a sector's approach and set of criteria to determine which roads/segments have potential to deliver sediment to streams.**

The Forest Roads Management Approach applies to roads that allow access to forestland or are used for forest resource management. These are known as "active" or "inactive" roads by the definitions of the Oregon Forest Practices Act (cite section).

Concerns exist about "legacy" roads and the risk of sediment delivery to waters of the state they present (cite). The road types described below link the concept of "legacy" roads, forest road best management practices in place at the time of road construction and the characteristics that may put them at risk of sediment delivery. For the purposes of this document, "legacy" roads are those that were not constructed to current Forest Practices Act standards (i.e. roads which are not Type 1 roads—link to FPA rules). These are often referred to as "old" roads by landowners and foresters who use "legacy road" to describe roads that were built prior to the Forest Practices Act, abandoned without reclamation, and likely to be currently covered with a stand of trees (cite FPAC). While age can be an important factor in forest road construction and hydrologic performance, determination of the risk of sediment delivery will ultimately be based on an age-independent set of characteristics described in Component 2 of this document.

Road Types

1. ***Roads built to current standards***. These are roads which have been constructed according to the standards of the major, road-related revisions to the FPA in 1984. Those revisions required full bench design and end-hauling of excavated material. Revisions in 1994 required design for 50 year flood events and fish passage for new crossing structures; wet-weather hauling and drainage-related rule revisions occurred in 2003. These roads include both active and inactive roads being used for forest management either for active logging operations or for other forest management related activities. This set of roads may include roads constructed prior to 1984 that were either re-constructed or updated to meet current rules and guidelines.

   This set of roads does not include vacated roads which have been intentionally and properly stabilized for permanent drainage and slope stability. If it is not stabilized, it is not a vacated road, and falls under the maintenance requirement for an inactive road.

   "Modern FPA Roads" are built to BMPs and guidelines which when properly located, built, surfaced, and maintained are recognized to be protective of waterways (cite). Resolve location selection concerns raised by Jeff Lockwood.

2. ***Roads built between 1972 and 1994.*** These are roads which were first constructed under the FPA using older rules (between 1972 and 1994) that were later determined to be not adequately protective of surface waters. These have some elements of water-protecting modern road design and BMP's but not as many as are contained in FPA rules since changes in 1984 and 1994. Issues on these roads are frequently related to the practice of side-casting excavated material onto steep slopes instead of end-hauling to a stable location, problematic locations (e.g. steep mid-slope roads), or undersized and restricted-passage culverts.

Commented [jds2]: And these elements are what exactly?

3. ***Pre-FPA roads and skid trails***. These are roads, or in many cases cat-built skid trails, which were INITIALLY used for forest management prior to any regulatory framework to oversee them. There are two types:
    a. Skid trails/roads which fell out of use for forest management purposes prior to the FPA in 1971. Most were built to allow tractor or skidder yarding rather than as roads accessible to truck traffic and generally pre-date the FPA harvesting rules. These were therefore steeper, narrower, involved little sidecast, were never meant to be permanent, and usually cannot be identified in modern aerial photography. They are usually vegetated like the surrounding forested area and have a thick layer of duff/soil over the old grade. They have mostly returned to a sediment-neutral situation where areas of old fills that were unstable have long since failed and revegetated (cite). To properly vacate these roads as per current FPA rules, tree-cutting and near complete rebuilding would be required to gain access to the limited number of troubled spots, followed by deconstruction after access is gained. This would likely generate more erosion than is actually mitigated. These are not considered part of the current road system for TMDL purposes.
    b. Roads built prior to the FPA which continued to be used after the FPA came into force in 1972. While some of these roads have since been properly vacated and are no longer are used for forest management, others span the gap between the first FPA rules and the current FPA rules and may have had various upgrades. If they have had upgrades, those upgrades are not sufficient to advance them to the Type 1 roads (see above definition). Some of these would not be built today given the modern FPA standards but continue to be used for forest management and should be upgraded to current standards at that time. They may still have risks such as oversteepened sidecast construction following upgrades or being located in riparian areas/floodplains.

Risk Criteria for Sediment Delivery

This section explains the factors controlling sediment generation and delivery from forest roads. It can assist forest road landowners and road managers in making an informed decision as to the recognition of the problem spots on their road system. Most landowners/road managers will already have a very good idea of where they could improve their road system to reduce the risk of sediment delivery to waterways, under what storm events they are likely to have a problem, and what steps can be taken to improve the situation. General principles for chronic/frequent sediment delivery, episodic sediment delivery, and factors common to both are given along with references to consult for further information. Specific problem types and situations need identification and remediation and are also explained below.

Reference GRAIP/GRAIP-Lite, ODF, NRCS road assessment protocols by link, reference, and summarize.

Chronic/Frequent Sediment Delivery

- There are two general principles to determining the likelihood a road will chronically or frequently deliver sediment to a waterbody (cite). Those are ***hydrologic connectivity*** (ability to deliver sediment to surface waters) and ***total disturbed road area*** (generation of sediment):

    - **Hydrologic connectivity:** If a road is hydrologically connected, then water which runs off of part of the road prism will enter surface waters. For example, if a ditchline drains a section of road and the stormwater from ditch flows into a stream, then that section of roadway is hydrologically connected. Conversely, if a culvert diverts the ditch water under the road and onto a stable area of the forest floor where the water filters into the soil, then that section of road is not hydrologically connected. In this case, sediment cannot be delivered to the waterbody.
    - **Total disturbed road area:** This is the area of the whole road prism – cut slope, ditch, road, and fill. If a road is newly constructed and vegetation has not reestablished itself on the cuts and fills, then it will have increased risk of generating sediment than a road whose fills are vegetated. If a road has a raveling section along a portion of cutslope which never revegetates, then this section is likely to have sediment running in the ditchline during rainfall and must be hydrologically disconnected from nearby waterbodies. Another example of sediment generation is if a road has native surfacing or the surfacing breaks down under heavy loads, mobilizing sediment that can move into connected waterways.
- A road segment with high sediment delivery potential must have both sediment generation and delivery to surface waters. If there is high sediment generation but none of the sediment can get to surface waters, then it is of little concern for water quality protection although it may present road maintenance problems (cite).
- Road systems should be hydrologically disconnected to the maximum extent practicable. A benchmark of 90% disconnection is generally achievable (cite).
- If a road is hydrologically connected, and it is not possible to disconnect it without extraordinary measures, then sediment generation must be minimized. Measures should also be taken to entrain mobilized sediment before it reaches surface waters (see BMP section).

Episodic Sediment Delivery

- Episodic delivery of large amounts of sediment from roads is generally due to failures of the road prism or stream crossing structures. These failures can happen for a variety of reasons, such as steep sidecast fillslopes sliding or plugging of cross-drains or stream crossing culverts followed by a washout. Large storms and the resulting runoff and streamflow increases can trigger these failures, dependant on circumstances. The two major contributing factors for episodic sediment delivery are **storm intensity** and the structure's **risk of failure** for a given storm intensity. Risk of failure is due to a combination of a structure's age, construction, damage from previous events, slope, stream power/gradient, etc. See citeX for more details.

Common Factors

- **Storm intensity:** Owners and road managers should also consider how well roads will perform during both smaller and larger rain events. A road must not deliver sediment to waterbodies during normal wet winter periods, or most major events, and culverts and crossing structures must also be able to handle normal wet weather periods with minimal impact. Landowners are expected to have their road systems prepared for 50-year event storm intensities without major failures or sediment delivery to the stream network which would cause water quality standards to be exceeded.

- **Sediment Delivery Factors** (can apply to chronic and/or episodic)**:**
    - Road proximity to surface waters
        - Amount of road area near or within riparian zone
    - Culverts/stream crossings
        - Type of crossing
        - Culvert fills
            - Depth
            - Armoring (insufficient to prevent erosion)
            - Organics in fills (logs, slash)
            - Log fills (log puncheons)
        - Culvert structure deterioration
        - Undersized culvert
    - Slope of area below road
    - Likelihood of slope failures reaching surface waters
    - Presence of springs/seeps
    - Cross-drains from road ditches
        - Cross-drain placement
        - Damaged drainage structures
        - Log drainage structures (puncheons)
    - Stream gradients

- **Generation of Sediment Factors:**
    - Underlying erosive soil types/geology
    - Total road prism area
    - Type and condition of surface material
    - Condition of road grade (cracking)
    - Slope of road and surrounding area
    - Sloughing on cutslopes
    - Oversteepened fillslopes from sidecast construction
    - Failure or likely failure of fills
    - Potential of a culvert to become plugged and washout or divert water onto roadway
    - Distance between cross-drains (slope dependent, see ODF Technical Note 8)
        - Downcutting in ditches indicates need for more frequent cross-drains
    - Anticipated use (i.e. light traffic vs. heavy machinery, travel frequency)

2. Reporting metrics to establish pre-Oregon Plan baseline (when applicable), current situation, and track progress during implementation of BMPs.

Category	Problem/Risk	Unit
Crossings	Undersized Culvert	# crossings
Crossings	Undersized Bridge	# crossings
Crossings	Damaged Culvert	# crossings
Crossings	Fish Passage Blocked	# crossings
Crossings	Undersized & Blocked Passage	# crossings
Crossings	Potential for Diversion	# crossings
Crossings	Log Puncheon	# crossings
Road Prism Failure	Built on unstable slopes*	# locations
Road Prism Failure	Steep sidecast construction*	# locations
Hydrology	Intercepted groundwater diverted†	# locations
Connectivity	Inadequate cross-drains	# miles
Connectivity	Inadequate surfacing	# miles
Connectivity	Connected to stream network	# miles

* Must have potential to deliver to surface waters in event of failure
† Groundwater diverted from natural flow pattern, e.g. diverted into an adjacent drainage

Definitions:

Undersized Culvert or Bridge: Crossing structure is too small to pass 50-year flow as calculated by ODF method (see Technical Note X). Upgrade to pass a minimum of 50-year flow (bridges or culverts with the ability to pass larger flows up to 100-year flow + large wood passage is encouraged).

Damaged Culvert: Culvert is damaged by human actions and/or natural process such as rusting to a degree where the structural integrity has deteriorated.

Fish Passage Blocked: Fish (juveniles or adults) cannot move through culvert due to outlet drops, excessive gradients, filling of the culvert by sediment, incorrect culvert alignment, accelerated flows, or other issues. Upgrade to allow fish passage.

Undersized Culvert & Blocked Fish Passage: Culvert is both too small to pass a 50-year flow and passage of juvenile or adult fish is blocked. Upgrade to allow fish passage with proper sizing.

Potential for Diversion: During high flow events, water is likely to overtop the stream crossing and flow down the road, rather than over the road and back into the stream (see X for further details). Redesign crossing structure to pass higher flows and/or direct overflows along an armored overflow that directs back to the stream.

Commented [jds3]: Refer to assessment method(s)

Commented [jds4]: Include USFS portable bridge reference in BMP section

Commented [jds5]: Encourage fords and bridges

Log Puncheon: Highly failure prone crossing or cross-drain structure made of logs running parallel to path of water. Replace with appropriately sized crossing structure or cross-drain culvert, respectively.

Built on Unstable Slopes: Road is constructed on a site which is unstable due to slope, highly sheared or otherwise unstable bedrock, convergent topography, high landslide hazard location, through the toe of a deep-seated landslide, or other characteristic that puts the road prism in that location at a significant likelihood of failure.

Steep Sidecast Construction: Cut-and-fill road design in location better suited to full bench construction. If fillslope is steeper than native hillslope, then road segment will be especially failure prone.

Intercepted Groundwater Diverted: Groundwater intercepted by the road prism (i.e. groundwater emerging from the ground of the cutslope or ditch) which is then diverted to a stream drainage other than the drainage of origin. Evaluate whether the volume of diverted water is significant compared to streamflow volume of source drainage or receiving drainage. Alter ditch and cross-drain structure to keep intercepted groundwater in drainage of origin if it can be done safely.

Inadequate Cross-Drains: Cross drain spacing or performance is inadequate, leading to excessive flows in the ditchline and/or existing cross-drains. This can be indicated by downcutting in ditches, excessive sediment generation within ditches and cross-drains, high-energy flows and erosion at outlets of existing cross-drains, or overflowing ditches. See ODF Technical Note #8. Add addition cross-drains, as appropriate to water volumes, lithology, and slope of road as detailed in Technical Note #8.

Inadequate Surfacing: Road surfacing is insufficient to prevent generation of sediment resulting from breakdown of the running surface or "pumping" of fines to the surface of the road; OR road is not properly shaped resulting in poor or uncontrolled drainage. This includes native surfaces and gravel surfaces with inadequate rock depth and/or durability. Indicators include rutting, ponding of water on roadway, water flowing on running surface, or surface mud on the roadway, in addition to other symptoms. Inadequate surfacing can lead to damage of the running surface and the subgrade of the road, interfering with proper drainage of stormwater and generating large amounts of moveable sediment that can travel to surface waters. This is especially important if road is hydrologically connected to surface waters (see below) or if breakdown of the road surface and interference with proper operation of the road's drainage system will elevate the risk of road prism failure. See cites.

Hydrologically Connected to Stream Network: Stormwater from the road prism (cutslope, drainage ditch, running surface, and fillslope) connects directly to surface waters rather than draining into undisturbed forest soils. This provides a direct conduit for sediment and other pollutants to reach waters of the state. Disconnect to the maximum extent practicable using cross-drain, sumps, and other techniques. When disconnection is not practicable, employ methods to filter runoff such as settling basins, straw bales, mycelium-enhanced straw bales, surfacing with durable gravel or paving of connected segments, or outsloping.

3. **Identify sediment delivery locations or road locations/features that are at risk of failure and delivery to waters of the state and submit a summary of that data to DEQ.**

All road network owners/managers must identify sediment delivery locations or road locations/features that are at risk of failure and delivery to waters of the state using the reporting metrics given above. A summary of that data will be submitted to DEQ as part of the implementation plan. Inventories done under the Oregon Plan for Salmon and Watersheds can be submitted and used as the baseline for purposes of compliance with milestones, although current baseline information will be required as well.

As the first step in implementation, information on the current condition of roads is needed. This baseline data will serve three primary purposes: 1) give forest road network owners/managers current knowledge of where ongoing problems and risks exist on their roads, enabling cost-effective preventative maintenance and improvements; 2) assist DEQ in understanding the extent to which roads are a sediment pollution source or risk; and 3) give a baseline from which to track progress on implementation of road network upgrades and enhancements. This baseline of current road condition will be the basis for determining compliance with TMDL milestones (see Table 1).

Many forest landowners previously completed road network inventories as part of their voluntary contributions to the Oregon Plan for Salmon and Watersheds. In addition, many landowners voluntarily acted upon those inventories, taking actions such replacing culverts that restricted fish passage before it was necessary and vacating problematic road segments. These inventories can be used as the road condition baseline for purposes of determining whether TMDL milestones are being met. A summary of current road conditions will still be necessary. Documented improvements done under the Oregon Plan will retroactively count as TMDL implementation for purpose of compliance with milestones.

Level of detail

4. **Along with inventory summary, road managers will need to submit a plan that projects when the problems and risks will be remediated in a manner that meets the milestones in the implementation timeline (Table 1). Basic plan components and structure will be outlined in the sector-based approaches. Alternate plan formats are allowable if overall planning goals are met.**

5. **The TDML will include Best Management Practice (BMP) references as options for managing and remediating problems and risks. Use of these BMPs will constitute the approved implementation activities under the TMDL. Alternate BMPs are allowable if the owner/manager demonstrates to DEQ that these will likewise accomplish the water quality goals.**

6. **Annual reporting is needed in order to summarize the work done over that year on the problems/risks identified, the total work done, and the work remaining (See "Objectives" above. The data, timelines, and the BMPs included in the TMDL will be developed and selected in consultation with stakeholders and/or outside experts. Mechanisms to facilitate reporting (e.g. through OWRI) are a priority.**

2. **Rank these roads or segments according to risk of delivery (e.g., high, med, low), based on the characteristics and screening criteria developed.**

This section explains how forest road landowners and road managers can make an informed decision as to the recognition and relative ranking of forest roads at risk of delivering sediment to waters of the state.

General Guidelines for the Ranking Process:

- Protecting fish-bearing streams and drinking water sources should accounted for during prioritization.
- The road segments and stream crossings that are the largest potential chronic sediment sources, likely to have the surface break down and deliver sediment during road use, or are most likely to catastrophically fail need to be the top priorities when landowners are doing road work in a particular area. These may not necessarily be the first activity, but high risk segments/features must be corrected as part of that project, i.e. not delayed, and project areas should be prioritized based on the largest potential sediment sources.
- This ranking should not include basic maintenance, but rather focus on roads or road segments constructed or located in a manner that puts them at higher risk of sediment delivery to waters of the state. The actual method by which a road system or location is ranked for risk of sediment delivery is not dictated here. However, the general principles and guidelines outlined here and in the references at the end of this section should be considered in the prioritization.

3. **Develop inventory and assessment reporting metrics needed to establish pre-Oregon Plan baseline and current situation. Outline potential implementation approaches in the MidCoast Basin in an adaptive management context. (Comment: This is not likely to be known prior to completion of TMDL, therefore need TMDL to reference BMP menu – see #5).**

Private Industrial Forestlands:

Inventory & Assessment Metrics

- Submit inventory of and schedule for legacy and other road improvements/obliteration under DEQ's regulatory IR-TMDL authority as described above. This could include an original survey and summary created for the Oregon Plan with accompanying accomplishment report if detail is sufficient. As feasible, links to accomplishments reported to OWRI could be included. Reporting should include the following metrics:

1. Total Road Miles in the Active/Inactive Road Network

2. Stream Crossings
    a. Number of crossings—w/ substantial risk of fill failure, stream diversion, or other catastrophic sediment delivery due to culvert size, crossing construction, or other issues [need ID protocol]
    b. Number of crossings—w/ substantial risk of sediment delivery due to potential connectivity, but without current sediment delivery [need ID protocol]

3. High Priority Road Locations (may be associated with Category 2 or 3b roads, see above):
    a. Riparian/waterbody adjacent roads (in wetlands/floodplains/channels/RMAs)
        i. Number of problem road locations (with estimated length for each location) and total road miles in this situation
        ii. Number of locations and road miles needing additional BMPs and improvements [need ID protocol]
        iii. Number of locations and road miles that need to be vacated [need ID protocol]

    b. Slopes with substantial sidecast construction which is steeper than the natural slope, excessive cutslope heights (generally over 15ft [OAR 629-625-0320(1)(b)(B)], but depends on situation), or fills with logs/organic debris.
        i. Number of problem road locations (with estimated length for each location) and total road miles in this situation
        ii. Number of locations and road miles needing additional BMPs and improvements [need ID protocol]
        iii. Number of locations and road miles that need to be vacated [need ID protocol]

    c. High landslide hazard locations where rock is likely to be highly sheared or otherwise unstable so that it is not possible to excavate a stable cutslope.
        i. Number of problem road locations (with estimated length for each location) and total road miles in this situation
        ii. Number of locations and road miles needing additional BMPs and improvements [need ID protocol]
        iii. Number of locations and road miles that need to be vacated [need ID protocol]

d. Locations cutting through the toe of deep-seated landslide deposits (particularly active or recently active) and where a reactivated landslide would likely enter waters of the state.
    i. Number of problem road locations (with estimated length for each location) and total road miles in this situation
    ii. Number of locations and road miles needing additional BMPs and improvements [need ID protocol]
    iii. Number of locations and road miles that need to be vacated [need ID protocol]

e. Extremely dissected, steep slopes where it is not possible to fit the road to the topography with full bench end haul construction.
    i. Number of problem road locations (with estimated length for each location) and total road miles in this situation
    ii. Number of locations and road miles needing additional BMPs and improvements [need ID protocol]
    iii. Number of locations and road miles that need to be vacated [need ID protocol]

f. Cross drain/ditch relief culverts creating risk to road prism and/or water quality (potential for failure/plugging, bad location (onto oversteepened soils, headwalls,), log puncheons, etc.)
    i. Number of problem road locations (with estimated length for each location) and total road miles in this situation
    ii. Number of locations and road miles needing additional BMPs and improvements [need ID protocol]
    iii. Number of locations and road miles that need to be vacated [need ID protocol]

4. Qualitative assessment of roads in Category 3a (see above), particularly crossing fills or road segments at high risk of failure
    i. If in or near a harvest operation, encourage remediation as a harvest BMP

- Oregon Plan for Salmon and Watersheds:
    - Inventories can be used. Updates may be needed to capture newer risks.
    - Problems/risks identified and remedied under the Oregon Plan may be included in the inventory, even if work is already completed, and then counted towards meeting milestones.
- Third-party certifications such as FSC may be sufficient to meet road inventory requirements.

<u>Improvement and Removal Plan</u>

- Describes how landowner will structure their road management program to meet the required milestones (see Table 1 below).
- Allows landowner to prioritize based on harvest and road maintenance schedules to implement the needed road improvements and vacating operations in an economically efficient fashion in addition to prioritizing based on highest risk.
- Oregon Plan or third-party certification-related documentation may be acceptable if detail is sufficient.
- Include details of how spatial, temporal, and risk-based prioritization will be done (see "Risk Criteria for Sediment Delivery" section above).

- Include basic outline of how work will be structured to ensure that milestones are met.
- Does not need to detail every individual improvement that will be done.

Reporting Progress

- Submit Progress Report to DEQ every two years.
- A consistent, electronic submission format will be needed for the Biennial Progress Report.
    - Landowner can do work in house or use a consultant.
    - Will be similar enough to OWRI that submissions will work for both OWRI reporting and IR-TMDL reporting.
    - Submission of certification audits/reports on metrics relevant to roads and water quality (FSC) may be sufficient.
- Progress Report will use the same metrics as the Inventory & Assessment.
- Progress Report gives a basic summary of accomplishments in the two-years since the previous Progress Report, the cumulative progress, and what remains to be accomplished in each category.
- New problems identified can be added to Inventory and work done will apply towards milestones (i.e. if problems are found and immediately fixed, the landowner can add them to the inventory and use the work done towards meeting milestones).

Table 1: Timeline & Milestones

Calendar Year	TMDL Year	Action Milestone
2013	0	TMDL Approved
2015	2	Inventory & Assessment Completed; Start Road Work
2017	4	Improvement & Removal Plan Approved
2019	6	-
2021	8	25% of Plan Work Completed
2023	10	-
2025	12	50% of Plan Work Completed
2027	14	-
2029	16	75% of Plan Work Completed
2031	18	-
2033	20	100% of Plan Work Completed

Family (Private Nonindustrial) Forestlands

- Survey roads for outstanding problems, immanent damage, and do regular storm patrols.
- USFS/ ODF Stewardship plans (the Roads & Access section), Oregon Tree Farm System certification and plans, Oregon Plan road inventories, or planning and reporting for sustainability certifications such as FSC can be used for the purposes of this IR-TMDL.

- Needs and opportunities as reported through the above planning processes will likely include elements of both "legacy" road placement and construction as well as smaller-scale road upgrades. With approval from USDA Forest Service, ODF may be able to target cost-share funds for development of land management plans to the Mid-Coast TMDL. This effort could be further incentivized by targeting reported road improvement opportunities for DEQ, OWEB, or other grants for implementation.
- Immediate or near-term (water quality impact likely to occur within the next 5 years) water quality risks must be remedied as quickly as possible.
- When harvest and hauling operations are scheduled and will make use of all or part of the road system, those parts to be used must be evaluated, problem locations must be identified (see Table 2 below), and repairs, reconstruction, or vacation (as necessary) must be done as part of the operation.

Monitoring/Evaluation

- ODF will report annually on notification inspections with road construction/reconstruction activities.
- Status and trend monitoring of hydrologic connection of the road network, locations at risk of catastrophic failure, and compliance with road rules can be done through ODF's Sustainable Forest Management Indicators. Indicators D.c (forest road risks to soil and water resources) and A.c (compliance with forestry regulations) are relevant to forest roads issues. Moving forward now on Indicator D.c is vitally important to creating baseline data for future analysis of TMDL load allocations and management measures. Supporting, initiating, and reporting on these two indicators every 5 years is needed to create regional (and statewide) status and trend data for forest road conditions and rule compliance. Using ODF's Indicator process would avoid wasteful duplication of effort and allow other TMDL effectiveness monitoring resources to be used elsewhere. DEQ will assist with the study design, evaluation, and interpretation of these two indicators.
- DEQ will monitor water quality and biological communities to track TMDL effectiveness and improvements in water quality and ensure water quality standards are met and beneficial uses are being supported.

4. For those roads/road segments reported as having potential sediment delivery, identify BMPs to be used resolve the issue (wide range of outcomes, DEQ can provide list of BMPs, transportation management to vacation/obliteration).

Prioritization

Operational

Water quality risk

Technical References

EPA Guidance (US Environmental Protection Agency)
http://www.epa.gov/owow/NPS/MMGI/Chapter3/ch3-2c.html &
http://www.epa.gov/owow/NPS/MMGI/Chapter3/ch3-2d.html

Forest Engineering Road Manual
http://egov.oregon.gov/ODF/STATE_FORESTS/docs/management/roads_manual/ForestRoadsManualCombined.pdf

Forest Road Management Guidebook (Oregon Department of Forestry)
Available from ODF

Illustrated Forest Practices Manual (Oregon Forest Resources Institute)
http://www.oregonforests.org/assets/uploads//OR_For_Protect_Laws_2011.pdf

Managing Woodland Roads: A Field Handbook (Oregon State University/OSU Extension)
Available from Oregon State University Extension

ODF Guidance for Division 625 (Road rules)
http://www.ohcs.oregon.gov/ODF/privateforests/docs/guidance/OARDiv625.pdf

ODF Technical Notes 7, 8, & 9 (Oregon Department of Forestry)
http://egov.oregon.gov/ODF/privateforests/TechReportsNumerical.shtml#monitoring

Oregon Plan Guidance (Oregon Department of Forestry)
http://www.oregon.gov/ODF/privateforests/docs/Oregon_Plan_PFguide.pdf

Oregon Forest Stewardship Planning Guidelines (OSU/ODF/Oregon Tree Farm System/OFRI)
http://www.oregon.gov/ODF/privateforests/docs/StewardshipPlanGuidelines.pdf?ga=t

US Forest Service GRAIP model
http://www.fs.fed.us/rm/boise/AWAE/briefing/Luce_FocusOnGRAIP.pdf

http://www.fs.fed.us/rm/boise/publications/misc/LuceRoadInventoryWatershedAnalysis.pdf

http://www.ohcs.oregon.gov/ODF/privateforests/MonitoringForestRoads.shtml

Washington Board Manual Section 3 (Washington State Department of Natural Resources)
http://www.dnr.wa.gov/Publications/fp_board_manual_section03.pdf

BACKGROUND - ISSUES AND APPROACHES

EPA/NOAA raised the issue of "legacy" roads in the CZARA/CNPCP documentation (1998, 2004) as an outstanding "measure" and one basis that they have not fully approved Oregon's CNPCP Program. EPA/NOAA have since provided additional information to clarify their concerns with forest roads and natural resource protection, in relation to the approval of Oregon's CNPCP Program.

For purposes of this evaluation, "legacy" roads is proposed to be defined as: *those roads/segments constructed before the effective date of the Oregon FPA (1972)*. (See section below "Does age matter?")

Pre-1972 roads were not subject to construction or maintenance standards and no specific requirements for abandonment or "vacating" roads was in place prior to 1972. Following 1972, a series of revisions to the FPA and associated roads construction and maintenance rules were enacted (see table 1. & associated narrative below) that make defining the effective age or date of a road/segment a moving target and thus an unreliable indicator of either condition or negative effects on soil and water.

Does age matter? Why Oregon's (ODF-DEQ) PENDING approach addresses the issues raised by EPA/NOAA in CNPCP documentation between 1998 and present.

Following numerous discussions and clarifications, it is apparent that **the primary concern EPA/NOAA concerns Private Forest roads (i.e., both FPA regulated and those pre-FPA) that have a potential to deliver sediment to streams and thereby pose a risk of negative impacts to natural resources, including water quality, aquatic life and other beneficial uses**. Oregon's (ODF-DEQ) PENDING approach addresses roads of various age categories, and is not limited to so-called "legacy" roads referred to in the CZARA/CNPCP documentation (1998, 2004).

Based on ODF-DEQ discussions thus far, we conclude that age is both difficult to determine and may be of little value in assessing road characteristics, with a few exceptions. Since a large proportion of private industrial forest roads were constructed to one standard, then re-constructed to newer standards, and possibly later maintained/upgraded to current or newer standards, the applicable BMPs and characteristics of the road/segment have probably changed multiple times since construction. What is of primary interest in the current characteristics of the road/segment. General classification of road/segment in relation to water quality and beneficial use protection is best done by characteristics, all or most of which are identified in existing documentation (see below).

Roads both constructed & abandoned pre-FPA (not active since 1972) should be defined as a separate category, to the extent that these roads/segments can be identified, since they are not under ODF jurisdiction. However, a large proportion of the road miles in this category may have mature vegetation growing on them and are thus inaccessible for either assessment or use of current "vacating" practices to ensure that they are not a source of sediment. These roads or segments were generally replaced by more current roads to access harvest units after 1972 (Mills paper; P. Daugherty pers comm).

Screening Approach: The Draft Forest Road Management Approach will use a screening approach to determine whether private forest roads have a potential to deliver sediment to streams, based on characteristics of roads/segments. The screens are taken from various sources of published information, primarily from the Oregon Dept of Forestry.

Characteristics of roads/segments. The first screen is road segment location, a defining characteristic that affects proximity of the road to waterbodies at various places along its length and whether a segment is located in a higher risk location (identified below)_____.

In Technical Note Number 7, ODF identifies the following characteristics of poorly located roads/segments: The key here is to reduce or eliminate roads in the following locations:

- where fill is placed in stream channels
- in riparian management areas
- crossing wetlands
- on high landslide hazard locations, especially when rock is weak
- cutting across the toe of old landslide deposits above streams
- on steep slopes with easily eroded soils (granitics)

http://www.ohcs.oregon.gov/ODF/privateforests/docs/CriticalRoadLocationsFPTechNote7.pdf

The second bullet includes road segments that are along streams. Road segments with these six location characteristics are considered poorly sited and generally pose a higher risk of sediment delivery to streams than other road segments. Many roads/segments are on flat terrain or near ridge tops where they do not cross streams and thus have no potential to deliver sediment to streams or block fish passage.

Oregon's Draft Forest Road Management Approach with assessment of road characteristics, and associated potential to deliver sediment to streams, is a necessary step in establishing a "Program" to address one of the outstanding "additional measures for forestry" identified in the EPA/NOAA documentation on approval of Oregon's CNPCP.

Elements of Oregon's Draft Forest Road Management Approach have been developed under the FPA and Oregon Plan. The Forest Practices Act and rules does not provide regulatory authority for a road road inventory and risk assessment . The FPA does provide authority for the State Forester to take enforcement action where sediment is being deliverd to waters of the state through its road rules (Division 625). Many practices were developed to meet FPA outcome-based requirements, follow guidance, or were voluntary measures completed under the auspices of the Oregon Plan.
Summary of gaps in current FPA according to EPA and NOAA:

- No specific road inventory and assessment requirement; no GIS based inventory.
- No required methodology when road inventory and/or assessment are conducted.
- No inventory & tracking of Oregon Plan voluntary actions at a geographic specific level.

Both the need and the value of a comprehensive road inventory and assessment/tracking program was also identified by ODF in the ***Oregon Indicator of Sustainable Forest Management D.c. : Forest road risks to soil and water resources*** http://www.oregon.gov/ODF/indicators/indicatorDc.shtml

Significant private and public (OWEB) expenditures have been made to upgrade the road network on land under private industrial ownership under the Oregon Plan (OR PLAN reporting _____). EPA/NOAA (2004) recognized this investment has played an important role in improving road conditions and fish passage, but repeatedly expressed that it is inadequate to meet CNPCP measures because it is not an enforceable "Program" and because it does not provide a verifiable reporting and monitoring component that would show that the management actions being reported are actually resulting in improvements.

SOLUTIONS

Several solutions have been discussed to satisfy EPA/NOAA concerns, including:

1. Adoption of a forest practices rule system equivalent to that in Washington's Forest and Fish Law (Road Maintenance and Abandonment Plans (RMAPs)).

2. Development of an Oregon Program that contains verifiable forest roads inventory, monitoring and reporting components showing that the management actions being reported result in meeting standards and necessary improvements to protect resources.

3. Management requirements akin to NW Forest Plan (NWFP) on US Forest Service lands.

Oregon (ODF-DEQ) has concluded that the best solution is to: develop an Oregon Program, building on existing efforts and addressing gaps. The starting point would be to: Develop a draft screening approach to determine which roads subject to the FPA have a potential to deliver sediment to streams, based on characteristics of roads/segments. Rank these according to risk of delivery (e.g., high, med, low) using specific areas of the MidCoast Basin*. This assessment may be combined with information from other assessments conducted by ODF on state-managed forestlands within three watersheds (Miami, Upper Nehalem, and Wilson).

NOTE: Similar monitoring was planned as part of the Oregon Plan for Salmon and Watersheds - Road Hazard Identification and Risk Reduction project, but has yet to be implemented.

***OWEB Region 2 (primarily South Coast)**: History of well-designed and executed road surveys and studies (TA grants) and road upgrades or decommissioning conducted (restoration grants). Similar road assessment activities have not been proposed or conducted in OWEB Region 1, including the MidCoast Basin, with exception of rapid road survey protocol proposed by this indicator is limited to state-managed forestlands within three watersheds (Miami, Upper Nehalem, and Wilson) and federal efforts in the Siuslaw NF. None of those were OWEB-funded projects.

There may be a variety of reasons for this, including physical constraints and socio-economic factors. The MidCoast Basin has some complex ownership patterns (see map), including multiple private timber ownership interspersed with other ownership, although this situation is not unique to the Oregon Coast Range. Also, some private forest landowners may believe that their management actions to date are in compliance with FPA and therefore it is not necessary to do anything else. Also, long-term studies of the effects of multiple forestry activities are being conducted in North Coast area (Wilson-Trask).

DEQ is working with USFS- Siuslaw NF and others to determine whether a modified GRAIP method is viable and would produce results that would be adequate to perform the classification of road system for risk of sediment delivery and provide a relative ranking of for prioritization of road segments for upgrades or decommissioning by landowners. The purpose of the modified approach would be to address more road miles at a reduced cost, given that a full GRAIP assessment and analysis is both comprehensive and highly resource intensive.

DEFINITIONS

Excerpt from *Forest Practices Advisory Committee on Salmon and Watersheds*, Section B; FPA Standards and Rules: http://www.oregon.gov/ODF/privateforests/docs/RptSecB.pdf

See also the State Forests Road Manual (2006) APPENDIX 6. ROAD TERMINOLOGY (Mainline, connector, Spur, etc): http://www.ohcs.oregon.gov/ODF/STATE_FORESTS/roadsmanual.shtml
http://www.ohcs.oregon.gov/ODF/STATE_FORESTS/docs/management/roads_manual/RMAppendix6.pdf

For the purposes of this issue paper, the following definitions will apply. A "road" normally refers to truck (sometimes called "haul") roads. Skid roads or trails (used by tracked or wheeled skidding machines to move logs from the stump to the landing) are only addressed in relation to ground-based harvesting on steep slopes in this issue paper. The Forest Practices Rules recognize three types of roads:

1. **Active**: Roads used for removing commercial forest products (regardless of the year constructed).
2. **Inactive**: Roads used for forest management purposes other than log hauling (regardless of the year constructed).
3. **Vacated**: Roads that have been purposely "put to bed", stabilized, and are impassible.

Current road maintenance rules (see Attachment A) require **maintenance** of both "active" and "inactive" roads. The term **"legacy" road** is not defined in the administrative rules. It is widely used in the public dialogue regarding forest road issues and has a different meaning depending on when and where it is used. ODF considers "legacy" roads to be synonymous with "abandoned" roads. Regardless of when a road was built, if it has been used for hauling logs or forest management since 1972, it is subject to regulation under the Forest Practices Act. The term "older" road is also used sometimes. The administrative rules continually evolve in response to changes in scientific knowledge; since the creation of the 1973 administrative rules, **major revisions to the road rules occurred in 1978, 1983, and 1994**. ODF considers "old" roads to be those built prior to the 1983 rule changes (i.e., roads built before end-hauling of material excavated from the road prism on steep slopes).

Road maintenance is required on all active and inactive roads. Regardless of when a road was constructed, if the road has been used as part of an **active operation after 1972**, it is subject to all maintenance requirements within the current rules.

Abandoned roads constructed prior to 1972 and not used for forest management since that time are not subject to Forest Practices regulatory authority. All roads in use since 1972 must either be maintained or vacated by the operator.

The department estimates that the majority of existing forest roads were constructed prior to 1983 (prior to rule changes which improved construction practices on steep slopes).

Increased turbidity can be associated with the use of roads during rainy or thawing periods (Bilby et al., 1989; Reid and Dunne, 1984). Currently, the wet-weather hauling rules direct operators to stop hauling when high levels of sediment begin to enter streams.

FPAC… V. Evaluation of Measures and Rules - Voluntary Measures

…To this end, many private landowners and State Forests have been implementing the Road Hazard Identification and Risk Reduction Project since 1997. Thousands of miles of roads have been inspected and repaired as part of this project (Oregon Plan Report, 2005). However, there is no record of how many total voluntary improvements were being considered by landowners or the summary record of completed actions. Implementation checks on reported actions were also not conducted by a third-party.

http://www.oregon.gov/ODF/privateforests/docs/RptSecB.pdf

Oregon Indicator of Sustainable Forest Management D.c. ; Forest road risks to soil and water resources

http://www.oregon.gov/ODF/indicators/indicatorDc.shtml

ATTACHMENTS

Statement from Keith Mills during Human Health criteria sub-group for Nonpoint Sources

Keith Mills

Legacy Roads Discussion for June 30 Non-NPDES Meeting

Comments on Legacy Roads

There is no definition of a "legacy" road in the Forest Practices Act or regulations. The Forest Practices has definitions for three types of roads: Active, Inactive and Vacated. Based on legal advice and department guidance any road used for forest management access since the effective date of the Forest Practices Act in 1971 falls into one of these categories. Active and Inactive roads must be maintained as needed to protect water quality as per the nine Sections (BMP's) under OAR 629-625-0600. A vacated road must be stabilized for permanent drainage and slope stability. If it is not stabilized, it is not a vacated road, and falls under the maintenance requirement for an inactive road.

A former road that has not been used for forest management access since 1971 will be covered with trees and other vegetation, have fills which were washed out by the many high flows over the last 40 years, and based on ODF state forests road surveys actually be less connected to streams (less of a risk of chronic erosion) than active or inactive roads. They may still have locations at risk of landslides. However, to access and repair these roads requires clearcutting the trees on the road prism, reconstruction of washed out sections, and then removal of these reconstructed sections. All of these activities will increase chronic erosion for the sake of reducing episodic erosion.

There may be a different understanding of legacy roads on Federal lands (BLM and especially USFS). On these lands, road maintenance budgets have been greatly reduced, and so legacy roads may be considered roads they no longer maintain, but most have been used since 1971. DEQ has designated both federal agencies as Designated Management Agents (DMA's) for water quality, and needs to ensure these agencies are addressing the road issue on federal lands. There may be an incorrect assumption that private and state forest roads are neglected like those on federal lands.

The Oregon Board of Forestry has adopted indicators of sustainable forestry, including a water quality indicator for forest roads for all forest land ownerships. To date, adequate resources have not been provided for this indicator. Despite the lack of dedicated resources, ODF is still working to implement this indicator over next winter on north and central coast forestlands. The extent of road systems, their connectivity to streams, and restrictions on fish passage are the metrics for this sustainable indicator. Hydrologic connectivity and disturbed road area provide the best indicators of chronic sediment delivery from roads.

1

DRAFT Sediment TMDL Road Management Outline

I. Mid Coast Implementation-Ready Sediment Total Maximum Daily Load: Road Network Desired Outcomes & Multi-Sector Approach

This document describes the goals and requirements for reducing sediment pollution from road systems in the Mid-Coast basin under the Oregon Department of Environmental Quality's (DEQ's) Implementation-Ready Total Maximum Daily Loads (IR-TMDLs) for the basin. It provides an overview of the major road ownership/management types and describes the overarching framework for reducing sedimentation from roads in the Mid Coast basin.

The intent of this portion of the sediment IR-TMDLs is to (a) prevent chronic or frequent introduction of fine sediment from the road network into waters of the state and (b) to reduce the risk of episodic sediment introduction from roads that were constructed using methods and/or in locations that may fail catastrophically and be problematic for water quality. DEQ's road approach, which includes assessment and management measures, applies to all land uses. However, in recognition of existing regulatory regimes and inherent differences in management methods and use patterns, there are detailed Road Management Approaches for three road sectors: Forestry, Agriculture, and Public Roads (i.e. state highways and county and municipal roads).

All land management sectors contain existing road segments or features that represent a risk of anthropogenic sediment delivery to waters of the state in the MidCoast Basin. The effect of roads as a source of fine sediment and other pollutants, and as a contributor to changes in hydrology, geomorphology, and fish passage is well documented for urban or rural residential roads (e.g. Paul & Meyer 2001, Konrad & Booth 2005, Walsh *et al* 2005), agricultural roads (e.g. Ziegler *et al* 2000, Scheetz & Bloser 2009), and forest roads (e.g. Reid & Dunne 1984, Jones *et al* 2000, Reiter *et al* 2009). Since all road-related sediment delivery to waters of the state is necessarily from anthropogenic sources, this category of sediment is a concern for attainment of water quality standards and resource protection and must be minimized to the maximum extent practicable. Water quality improvements from changes in road construction and management practices are likewise documented and available (e.g. Scheetz & Bloser 2009, Reiter *et al* 2009), and there are available guidance materials and Best Management Practices for planning, design, construction, and maintenance. This program consists of measures to identify roads that are considered at risk of delivering sediment or turbidity to waters of the state, to bring the road network to a level of performance that is consistent with TMDL goals and objectives, and thereby reduce and prevent water quality impacts and protect beneficial uses.

Sediment TMDLs Goals & Objectives

Water Quality Goals

- No more than 10% increase in turbidity due to roads at relevant compliance points, e.g. downstream of crossing structures or due to road-related landslides (Turbidity Standard: OAR 340-041-0036).
- No impairment of aquatic life and drinking water use due to anthropogenic sedimentation (Biocriteria, Potability of Drinking Water, and Sediment narrative standards: OARs 340-041-0011, 340-041-0007(11), and 340-041-0007 (12), respectively).

Road Network Goals

- An efficient and beneficial road network that is located, designed, constructed, and managed in a manner that provides protection to water quality
- No exceedance of water quality standards due to roads, crossing structures, and their use by the public and commercial traffic.
- Hydrologically disconnected road network (to the maximum extent practicable) using available BMPs (including maintenance practices) and good design principles.

Road Network Objectives

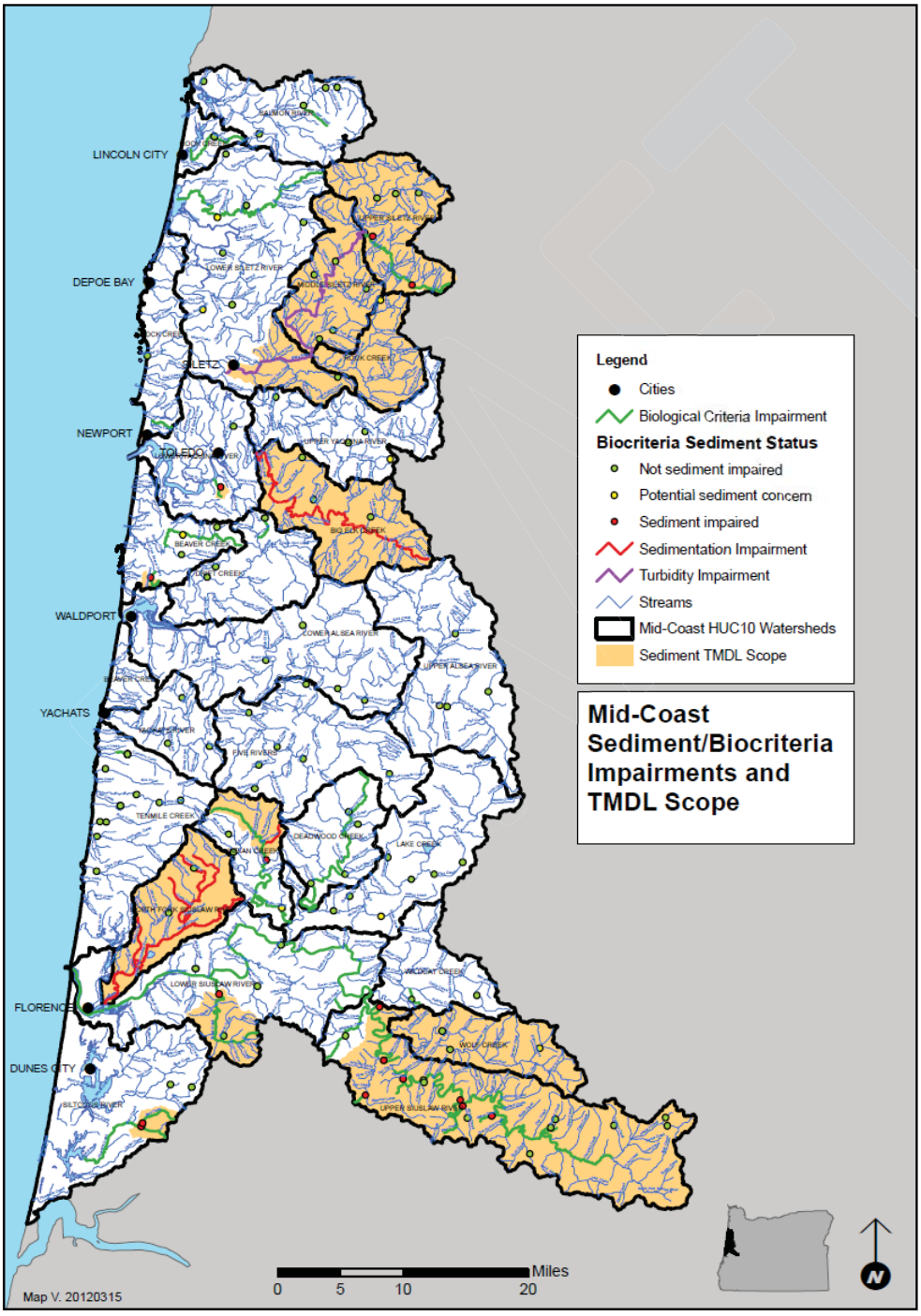
- The road network meets current requirements and guidelines of the relevant statutes and regulations (e.g. Forest Practices Act and rules for forestry roads and use, Agricultural Water Quality Management Act (SB 1010) Area Rules for agricultural roads, applicable state laws and county ordinances for state highways and county roads) as the primary basis for achieving water quality goals for sediment.
- Road maintenance operations are performed as needed including regular inspections and timely repair of storm damage.
- Any existing problem road locations are identified by landowner or manager by segments or features.
- In some cases, existing rules do not require proactive improvement of the road network to achieve water quality goals for sediment. Road managers implement practices that exceed current rules & guidance, such as Oregon Plan voluntary measures, where necessary to meet water quality goals for sediment.
- Road system owner/operator identifies problems or risks from crossings, road prism failure, hydrology, and connectivity (specific problem/risk categories by land ownership/management can be found in the sector-based road approaches).
- Identified problems and risks in the road network are remediated according to TMDL timelines and milestones.
- Road system owner/operator reports actions taken by:
    - Category of problem or risk, and
    - Problem/Risk (by appropriate unit of measurement).

  For each Problem/Risk, landowner reports:
    - Initial Number;
    - Number Completed in Current Year (total and number per 5th or 6th field Hydrologic Unit Code (HUC));
    - Number Completed to Date;
    - Percent Completed to Date;
    - Number Remaining to Complete;
    - Number Expected to be Completed in Upcoming Year (total and number per 5th or 6th field HUC).

  Reporting on a project-by-project basis may be possible through the Oregon Watershed Enhancement Board's Oregon Water Resources Inventory (OWRI) reporting mechanism. This would allow DEQ to download data as a means of getting yearly reporting from landowners rather than direct submission of reports to DEQ. The OWRI system would need minor modifications; DEQ will work with OWEB to coordinate and streamline reporting of improvements.

Geographical Scope of IR-TMDL

The sediment portion of the Implementation-Ready Total Maximum Daily Load (IR-TMDL) load allocations and management measures apply to the areas identified on the 2010 303(d) list and the areas with identified biocriteria impairments associated with excess sedimentation. These areas are shown on the map below. The requirements of the IR-TMDL for sediment do not apply to the remainder of the Mid-Coast basin, but DEQ encourages implementation and the use of this approach basin-wide. Basin-wide (or coastal zone-wide) approach: landowner could develop a Section 319 watershed Nonpoint Source plan, either alone or in collaboration with other partners and stakeholders. DEQ can provide guidance and assistance in development of a watershed plan.



Process Outline:

Stratify roads by risk type → Categorize risk/impact → Identify BMPs → Implement BMPs → Track implementation & monitor water quality

Road Management Approach Components:

Each sector's road management approach has the following components:

- Develop a working definition of which roads are covered by a sector's approach, and develop a set of criteria to determine which roads/segments have potential to deliver sediment to streams.
- Develop reporting metrics needed to establish pre-Oregon Plan baseline (when applicable) & current situation and to track progress through implementation of BMPs.
- All road network owners/managers must identify sediment delivery locations or road locations/features that are at risk of failure and delivery to waters of the state. A summary of that data will be submitted to DEQ as part of the implementation plan. Inventories done under the Oregon Plan for Salmon and Watersheds can be submitted and used as the baseline for purposes of compliance with milestones, although updated information will be required as well.
- Along with inventory summary, road managers will need to submit a plan that projects when the problems and risks will be remediated in a manner that meets the milestones in the implementation timeline (Table 1). Basic plan components and structure will be outlined in the sector-based approaches. Alternate plan formats are allowable if overall planning goals are met.
- The TDML will include Best Management Practice (BMP) references as options for managing and remediating problems and risks. Use of these BMPs will constitute the approved implementation activities under the TMDL. Alternate BMPs are allowable if the owner/manager demonstrates to DEQ that these will likewise accomplish the water quality goals.
- Annual reporting is needed in order to summarize the work done over that year on the problems/risks identified, the total work done, and the work remaining (See "Objectives" above. The data, timelines, and the BMPs included in the TMDL will be developed and selected in consultation with stakeholders and/or outside experts. Mechanisms to facilitate reporting (e.g. through OWRI) are a priority.

Table 1: Implementation Timeline & Milestones

Calendar Year	TMDL Year	Action Milestone
2013	0	TMDL Approved
2015	2	Inventory & Assessment Under Way; Start Road Work
2017	4	Inventory & Assessment Completed; Improvement & Removal Plan Submitted
2019	6	-
2021	8	25% of Plan Work Completed
2023	10	-
2025	12	50% of Plan Work Completed
2027	14	-
2029	16	75% of Plan Work Completed
2031	18	-
2033	20	100% of Plan Work Completed

The three road sector approaches (Forestry, Agriculture, and Public Roads) will share the above described components. However, the specific means to accomplish those components (initial data, projected work, reporting, BMPs & implementation) will be tailored to the management practices, land use needs, particular water quality impacts/risks, and regulatory structure of the sector. For example, the Forest Roads Approach will have BMPs to address roads built using sidecast construction on steep slopes; agricultural roads will generally not have this risk, but operators will need to address rainy season use of inadequately surfaced roads near to surface water similarly to forest road system operators. Therefore, the three sector-based approaches will have issues in common as well as issues unique to a particular sector. The timeline and milestones will be common to all three approaches. Public roads, agricultural roads, and forest roads are all expected to meet water quality goals and road network goals and objectives.

Clarification of Responsibility:

Generally, the owner or designated land manager/land management agency is responsible for compliance with the requirements of this TMDL, and the applicable road sector approach is determined by land use. Some cases of ambiguity exist as to which sector some roads belong. Examples include driveways and private roads in subdivisions and similar developments. Driveways are to be covered under the Agricultural Roads Management Approach. Private roads in subdivisions and similar cases that do not qualify as driveways will be covered under the Public Roads Management Approach through

county authorities. Financial responsibility would rest with the party who is legally responsible for maintenance of those private roads.

There will also be cases where one party owns the land, and another party owns a right-of-way on that land. If responsibility is unclear (i.e. no agreements exist on who is responsible for road maintenance, and established laws do not assign responsibility), then the owner of the right-of-way is the default responsible party for road maintenance and upgrades.

Following this introduction, there are three sector-based Road Approaches. These Approaches constitute the load allocation surrogates and required management measures for the roads component of the Mid Coast Sediment TMDLs.

References:

Jones, JA, FJ Swanson, BC Wemple, and KU Snyder. 2000. Effects of roads on hydrology, geomorphology, and disturbance patches in stream networks. *Conservation Biology* **14:** 76-85.

Konrad, CP, and DB Booth. 2005. Hydrologic changes in urban streams and their ecological significance. Pages 157–177 In (*eds* Brown LR, Gray RH, Hughes RM, Meador MR) *Effects of Urbanization on Stream Ecosystems.* Symposium 47. American Fisheries Society, Bethesda, Maryland.

Paul, MJ, and JL Meyer. 2001. Streams in the urban landscape. *Annual Review of Ecology and Systematics* **32:** 333–365.

Reid, LM and T Dunne. 1984. Sediment production from forest road surfaces. *Water Resources Research* **20:** 1753-1761.

Reiter, M, JT Heffner, S Beech, T Turner, and RE Bilby. 2009. Temporal and spatial turbidity patterns over 20 years in a managed forest of Western Washington. *Journal of the American Water Resources Association* **45:** 793-808.

Scheetz, BE, and SM Bloser. 2009. Environmentally sensitive maintenance on agricultural roads to reduce nutrient and sediment pollution in the Kishacoquillas watershed. Thomas D. Larsen Transportation Institute, Pennsylvania State University, Report NRCS68-3A75-5-167.

Walsh, CJ, TD Fletcher, and AR Ladson. 2005. Stream restoration in urban catchments through redesigning stormwater systems: Looking to the catchment to save the stream. *Journal of the North American Benthological Society* **24:** 690–705.

Ziegler, AD, RA Sutherland, and TW Giambelluca. 2000. Partitioning total erosion on unpaved roads into splash and hydraulic components: The roles of interstorm surface preparation and dynamic erodibility. *Water Resources Research* **36:** 2787-2791.

II. Forest Roads Management Approach

Meetings with ODF (Coordination, Scoping, Informational):	January-August, 2012
Initial Draft to TWG:	August 15th, 2012
Forest Roads Sub-Group Meeting:	September 5th, 2012
Assessment Metrics for Forest Roads to TWG & LSAC:	September 18th & 19th, 2012

Current Activities:
Revising draft document to incorporate TWG, LSAC, and Sub-Group suggestions & information
Reading and evaluating forest roads references/resources

III. Agricultural Roads Management Approach

Agricultural Roads Sub-Group Meeting: October 10th, 2012
Meeting Notes & Basic Outline to Sub-Group: November 19th, 2012

Current Activities:
Writing initial draft document.
Reading and evaluating agricultural/rural roads references/resources

IV. Public Roads Management Approach

Public Roads Sub-Group Meeting: November 29th, 2012
Meeting Notes & Basic Approach Outline to Sub-Group: December 19th, 2012

Current Activities:
Writing initial draft document
Reading and evaluating materials provided by ODOT and Lane County, other references